

have their limitations, and when he passes from fresh to salt water (metaphorically speaking) he appears somewhat "out of his element." Otherwise he would not have quoted antiquated and rejected notions regarding the growth of salmon after its migration to the sea in the face of the well-ascertained results of a vast amount of more recent research. Again, the author's account of the life-history of the eel is not abreast of current knowledge, since he makes no mention of the most important and not so very recent discovery of the breeding-grounds of this species all along the eastern shelf of the Atlantic basin. Reading M. Guénaux's account, one would suppose that the latest word on the subject of the eel had been said by Signors Grassi and Calandruccio, which is not so.

Then, again, the fear (casually expressed, it is true) lest certain species of pelagic sea fishes, such as the pilchards (sardines) off the west coast of France, be in danger of extermination through over-fishing is probably unwarranted, and argues a lack of knowledge of the conditions of life in the sea. Finally, returning to the salmon, it will surely surprise anyone who has some knowledge of the Highlands of Scotland and of the rigorous restrictions to which salmon-fishing is subjected in this region at the present day, to be told that :—

"Aujourd'hui, c'est dans ce pays [viz., Scotland] que les domestiques sont obligés de stipuler à l'avance que le saumon ne paraîtra trop fréquemment dans leur ordinaire!"

These happy days are almost ancient history. But such matters are, after all, quite on the fringe of M. Guénaux's subject. Enough has been said to indicate that the book is a small mine of information, and should be consulted by all whose business or pleasure brings them face to face with any of the difficult problems connected with fresh-water pisciculture.

WILLIAM WALLACE.

A CYCLOPÆDIA OF AGRICULTURAL CHEMISTRY.

Kleines Handwörterbuch der Agrikulturchemie. By Dr. Max Passon. Two vols. Erster Teil, Aadikynurensäure. Pp. iv + 454. Zweiter Teil, Labzymogen. Pp. 415. (Leipzig: Verlag von Wilhelm Engelmann, 1910.) Price 22 marks.

THESE two volumes bear striking testimony to the enormous strides made during the last twenty years in agricultural chemistry. Only within very recent times has the need for a cyclopædia been felt; previously the chemist could always pull through if he possessed one of the larger analytical treatises and had access to a set of the *Jahresberichte* for agricultural chemistry. Rapid progress set in when the subject was emancipated from the analytical stage; when the chemist, instead of being confronted with an interminable succession of analyses of manures, feeding-stuffs, and soils, was free to study the numerous problems presented by the plant in its relation to the soil, on the one hand, and the animal on the other.

To the popular mind the agricultural chemist is still an analyst, and beyond doubt the analyst is more necessary than ever he was; but the distinction be-

tween the two is fast becoming as sharp as in pure chemistry. This process of segregation is going even further, and already men are specialising in the various branches of agricultural chemistry itself. Hence the need of reference books like the present volumes.

One of the features of the book is the treatment of laboratory operations. The ordinary methods are dealt with in some detail, there are numerous illustrations, and, where necessary, tables of figures. Even such minor but important processes as the recovery of platinum, silver, &c., from their residues find a place. In addition, a number of tests are given, and methods for finding whether nitrogen is present as an amide group, an amino-acid, or an ammonium salt. Although these are probably the fullest articles in the volumes they are rather restricted in their scope, attention is devoted almost exclusively to German methods, little space being given to those in use elsewhere. In several instances the book suffers in consequence. Thus we find the methods for the mechanical analysis of soils are very incomplete; the separations are carried only far enough to include material more than 0·2 mm. in diameter, all below this limit being grouped together as fine sand, &c. This is very unfortunate, because it is now known that the finer fractions—those falling between 0·2 and 0·04 mm., between 0·04 and 0·01 mm., between 0·01 and 0·002 mm., and below 0·002 mm.—really play a controlling part in soil fertility; indeed, no soil analysis can be fully interpreted without knowing them.

The book is, however, more than a laboratory manual, and space is found for some of the great generalisations and theories that have played a part in the development of the subject. The treatment is all too brief, especially when one remembers the importance rightly attached in Germany to theoretical considerations. Liebig's famous "law of the minimum" is stated, but its modern developments are not mentioned. "The growth of the plant is governed by the quantity in the soil of that food constituent which is present in the smallest amount." This generalisation has proved of great value in agriculture, but it is now merged in the wider conception of limiting factors, which we should like to have seen discussed in the book. It is now recognised that certain requirements must be fulfilled before plants will grow well—there must be ample water, air, warmth, food, light, and no injurious substance must be present. Any increase in one of these factors may lead to an increased crop production, but the increase is soon limited by the insufficiency of some one or more of the other necessary factors. If all are increased, the limit is finally set by the plant itself. In general, however, modern hypotheses are not given; we have been unable to find any mention of the well-known toxin-excretion theory of Whitney, which supposes that infertility arises through the excretion of toxic substances by plant roots. Whether it ultimately turns out correct or not, this theory has led to so much investigation that it deserved a place.

A critic could easily point out much more that has been omitted. But he would find it difficult to see how it could be otherwise within the limits of two

volumes, the available space of which has been still further reduced by the numerous good illustrations the editor gives us. There are, however, cases where the really important information is not given. Take, for instance, the note on *Molinia coerulea*. We are told that it has the power of absorbing considerable quantities of the salts of heavy metals, and a case is quoted where the ash contained 2·041 per cent. of lead oxide, 0·266 per cent. of copper oxide, and 0·265 per cent. of zinc oxide; further, we are told that it is regarded as a bad pasture grass. Now molinia is a weed and not a cultivated crop, and the things the chemist wants to know about it are these: What soil conditions does the presence of molinia indicate? and has molinia ever been observed to produce any ill-effect on animals? if so, what is the harmful constituent? Information could have been given on the first point that would have been valuable, for molinia is a useful "indicator" plant. Again, we are given analyses of animal excreta, but no mention is made of the fact that the composition is very variable, nor are we told whether the figures represent means of many analyses or only one or two determinations.

A more serious defect, however, is the omission of references. The student is rarely told where to go for fuller information, and it is practically impossible for him to check the data given in the article unless he knows his way about the literature of the subject. It is inevitable that dictionary notes should be short and should omit much; their great value ought to be the guidance they afford to the man who wants to learn more. But even with this defect the volumes are very useful, and will prove a distinct acquisition to the agricultural chemist.

E. J. RUSSELL.

RADIO-CHEMISTRY.

Radiochemistry. By A. T. Cameron. Pp. viii + 174. (London: J. M. Dent and Sons, Ltd., 1910.) Price 2s. 6d. net.

THIS book purports to be an "exact account of our present knowledge of the chemical properties of the radioactive substances and their chemical effects," and in the preface much stress is laid on the "accuracy" of the facts and theories here presented. It is further stated that the subject is "treated from a chemical standpoint," while "the physical side is introduced only so far as is necessary to explain the special experimental methods." As to how well the author has attained the latter object can be best judged from two examples, one a description (quite incorrectly asserted to be "that in Rutherford's 'Radioactivity,' p. 86") of a Wilson type of electroscope (p. 10), where, in addition to a very extraordinary earth connection, the movement of the aluminium leaf is observed by a "telescope" which "carries a scale," a distinctly inconvenient and unusual arrangement; and the other a description of a Dolszalek electrometer (p. 13) having "one pair of quadrants connected to earth, the other to an insulated metallic plate facing a second which carries the radioactive matter to be tested." "Through action similar to that in the case of an electroscope an electric stress is set up between the two pairs," and "the needle, previously charged

to a very high potential, is repelled from one pair of electrodes towards the other"!

The chapter on the "Classification of the Radioactive Elements—their Physical and Chemical Properties" might be expected to justify the title chosen for the book, but it is disappointing to an extreme extent; the chemical properties of uranium, for example, being dismissed with the bare statement that "it belongs to the iron group of elements and is precipitated by ammonium carbonate." The discussion of the identification of ionium is quite misleading, and the account of the chemical properties of the other radio-elements of a very superficial character. The statement that thorium "occurs chiefly in Ceylon" is certainly surprising. It is doubtful whether anyone not already somewhat familiar with the subject could separate or identify a single radio-element from the directions which are given.

Errors and misleading statements are not uncommon. Thus (p. 17) the simple exponential equation $I_t = I_0 e^{-\lambda t}$ is given in an inverted and incorrect form, which again appears later (p. 90). Further examples are the statements (pp. 56, 141) that radio-thorium "is precipitated with barium," "resembles radium in every respect," and has an activity "several hundred thousand times that of radium"; that in the separation of uranium X by treatment with a mixture of ether and water (p. 39) "the ether layer contains most of the photographic or β -ray activity"; that the active deposit from the radium emanation (p. 51) "decays to half value in twenty-eight minutes, but the decay curve is very irregular"; and that "the actinium products have all extremely short lives so that the maximum activity is quickly reached (p. 56)." The mention of the "decay curve of a radioactive child" (p. 17) certainly suggests the most gruesome possibilities!

B. B. BOLTWOOD.

EGYPTOLOGICAL RESEARCHES.

Egyptological Researches. By W. Max Müller. Vol. ii., Results of a Journey in 1909. Pp. v + 188 + 47 plates. (Washington: Carnegie Institution, 1910.)

FOUR years ago Herr W. M. Müller, now of Philadelphia, published a first volume of "Egyptological Researches," brought out at the expense of the Carnegie Institution of Washington, which had borne the expense of the journey to Egypt in 1904 the results of which were thus published by Herr Müller. In 1906 Herr Müller undertook a second journey to Egypt, and now publishes a second volume of these "Researches."

Herr Müller's chief aim on both journeys was to pick up as much as possible of the hitherto unedited and badly edited historical material which still is to be found in the inscriptions of Thebes, notwithstanding the labours of many Egyptologists. In his first volume he published in colour the extant remains of the famous pictures of Minoan Cretan ambassadors in the tomb of Senmut, the prime minister of Queen Hatshepsut, which are so important to the Greek archaeologists. These pictures had already been pub-